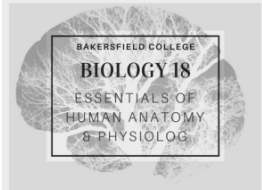
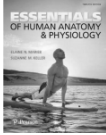


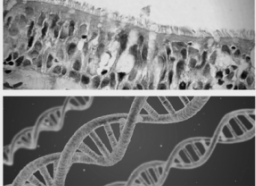
Lecture #2: Orientation to the Human Body

Chapter 1





Marieb, 2018. Essentials of Human Anatomy & Physiology (12th Ed.)
ISBN 978-0134395326



Objectives

- Define anatomy and physiology and explain how they are related.
- Name the levels of structural organization that make up the human body and explain how they are related.
- Name the organ systems of the body and briefly state the major functions of each system.
- List the functions that humans must perform to maintain life.
- List the survival needs of the human body.
- Define homeostasis and explain its importance.
- Define negative feedback and describe its role in maintaining homeostasis and normal body function.
- Describe and demonstrate proper anatomical position.
- Use proper anatomical terminology to describe body directions, surfaces, and body planes.
- Locate the major body cavities and list the chief organs in each cavity.

Important Word Roots

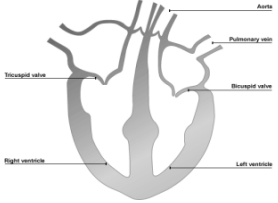
Anatomy	Physiology
<ul style="list-style-type: none"> • Study of structure (shape of the body and its parts) 	<ul style="list-style-type: none"> • Study of function (how the body and its parts work or function)

Page 1

I. Overview

Anatomy and physiology are always related

- Structure determines function
 - Pathology – study of structural changes that lead to disease




How many chambers?
What's the structure?
What's the function?

www.bbc.co.uk

Page 1

Anatomy:

Structure



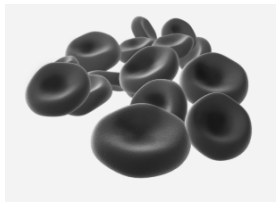
Physiology:
Function

- If I change the structure does it affect the function?
- What happens if I fracture my femur?

[Medical Dictionary](http://www.medicaldictionary.com)

Page 1

Red Blood Cell



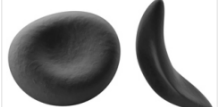
Structure?

- Biconcave
- No Nucleus
- Hemoglobin

Function?

- Transport Oxygen

If you change the structure do you change the function?



www.clipartkid.com
www.whattoexpect.com

Page 1

II. Levels of Study

Macro = Big

A. Gross (macroscopic) Anatomy

1. Study of large structures that are easily visible to the naked eye
2. Subdivisions include regional, systemic, and surface anatomy


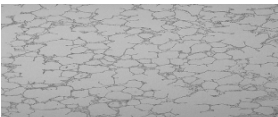
Page 1

II. Levels of Study

Micro = small

B. Microscopic Anatomy

1. Study of very small structures that can only be viewed with a microscope
2. Subdivisions include cytology and histology

<http://www.amscope.com>

Bottom of page 1

III. Levels of Structures

Figure 1.1

Chemicals →

Organelles →

Cells →

Tissues →

Organs →

Organ systems →

Organism

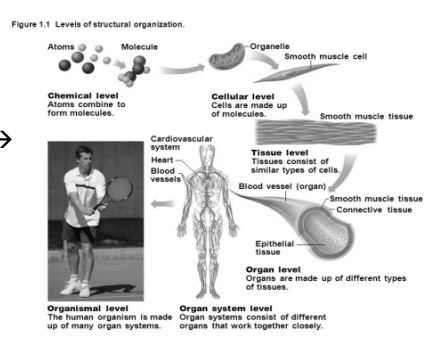


Figure 1.1 Levels of structural organization.

Chemical level
Atoms combine to form molecules.

Cellular level
Cells are made up of molecules.

Tissue level
Tissues consist of similar types of cells.

Organ level
Organs are made up of different types of tissues.


Organ system level
Organ systems consist of different organs that work together closely.

Organismal level
The human organism is made up of many organ systems.

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Disease State: Hypertension

Treats at a cellular level




Medscape

¹ IV. Organ System Overview: 7 Organ Systems

I/L	Immune/Lymphatic
N	Nervous *
E	Endocrine
R	Reproductive
R	Respiratory
D	Digestive
M	Muscular *
U	Urinary
S	Skeletal *
I	Integumentary *
C	Cardiovascular

I Love
NERRD
MUSIC


Figure 1.3 for reference

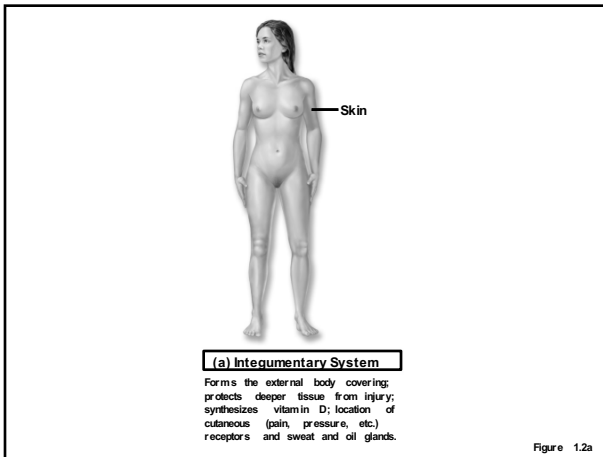


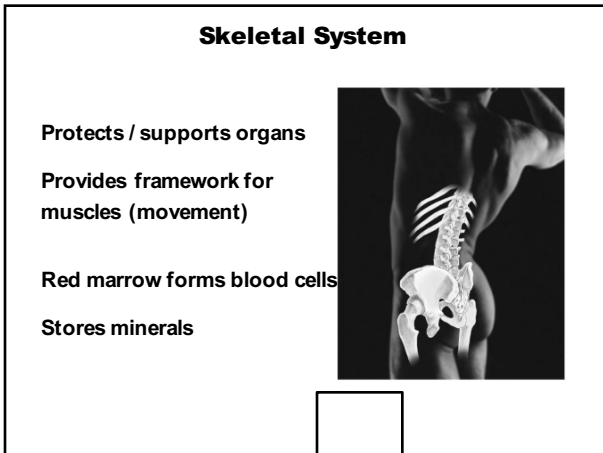
The Skeletal System
Protects and supports body organs and provides a framework for movement. It also stores minerals, produces blood cells, and anchors muscles. Bones are made of living tissue.

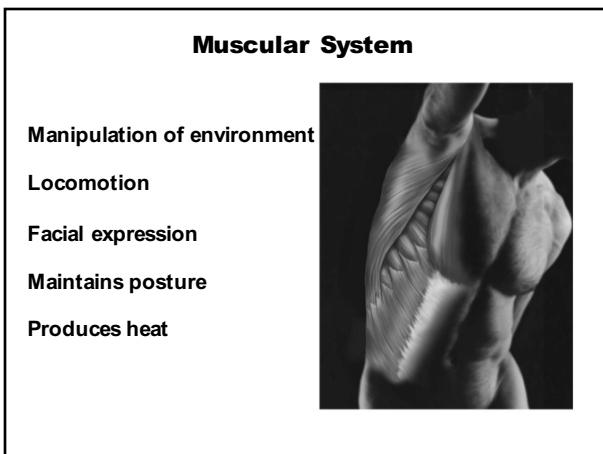
Integumentary System

- External body covering**
- Protects deeper tissues**
- Synthesizes vitamin D**
- Houses cutaneous receptors:**
 pain, pressure, etc.
- Houses sweat and oil glands**









Nervous System

Control system of the body:

Responds to internal and external changes

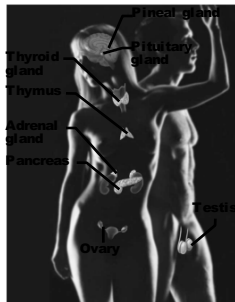
by activating muscles/glands



Endocrine System

Glands secrete hormones

Hormones regulate processes:
growth
reproduction
nutrient use (metabolism)



Cardiovascular System

Heart pumps blood

Vessels transport blood
oxygen
carbon dioxide
nutrients
wastes
etc.



Lymphatic System/Immunity

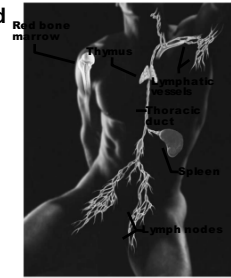
Picks up fluid leaked from blood vessels; returns it to blood

Disposes debris (lymphatic stream)

Houses white blood cells (immunity)

Attacks foreign substances (immunity)

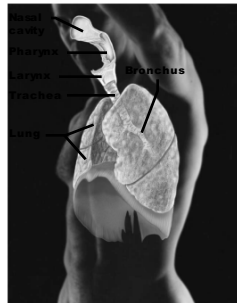
Affects behavior, social interaction (immunity, new research: <http://tinyurl.com/zo66mcr>)



Respiratory System

Gas exchange

Supplies O₂, removes CO₂



Digestive System

Breaks down food into absorbable units

Nutrients enter blood, distributed to body cells


Indigestible stuff eliminated as feces



Urinary System

Eliminates nitrogenous wastes

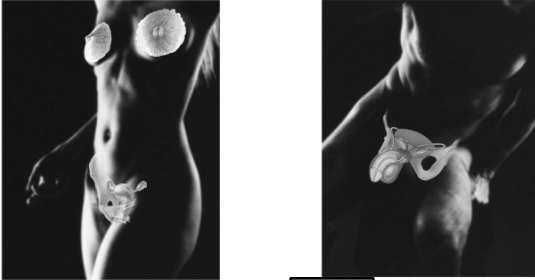
Regulates blood:
water
electrolytes
acid-base balance



[]

Reproductive System

Production of offspring
Female only: site of fertilization
development of the fetus
nourishment of newborn




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Page 1-2

8 Necessary Life Functions

1. Maintain boundaries
– Insides remain distinct from outside
2. Movement
– Locomotion
– Movement of substances
3. Responsiveness
– Ability to sense changes and react
4. Digestion
– Breakdown, absorption, and delivery of nutrients

Draw a Cell



Page 2

8 Necessary Life Functions

5. Metabolism—chemical reactions within the body

- Production of energy
- Making body structures

6. Excretion

- Eliminates waste from metabolic reactions (through urine or feces)

Page 2

8 Necessary Life Functions

7. Reproduction

- Production of offspring

8. Growth

- Increases in cell size and number of cells

Page 2

V. Maintaining Life

B. Survival Needs

1. Nutrients

- a. Chemicals for energy and cell building
- b. Includes carbohydrates, proteins, lipids, vitamins, and minerals

2. Oxygen

- a. Required for chemical reactions

When you die of suffocation why do you die?

3. Water

- a. 60-80% of body weight
- b. Involved in metabolic reactions

Can you die of dehydration?

4. Stable body temperature

Needed for proteins and enzymes to be shaped properly and work properly.

5. Appropriate atmospheric pressure

What organ system is connected to outside pressure?

Respiratory System

Page 2

VI. Homeostasis – maintaining a stable internal environment within narrow limits, regardless of environmental changes

A. Must be maintained for normal body functioning and to sustain life Maintained through a feedback loop

```

    graph TD
      stimulus[stimulus] --> receptor((receptor))
      receptor --> integrating_center((integrating center))
      integrating_center --> effector((effector))
      effector --> response[response]
      response --> stimulus
      response -.->|inhibits| receptor
  
```

Homeostasis

Examples of Regulation:

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Temperature CO₂ Water Balance

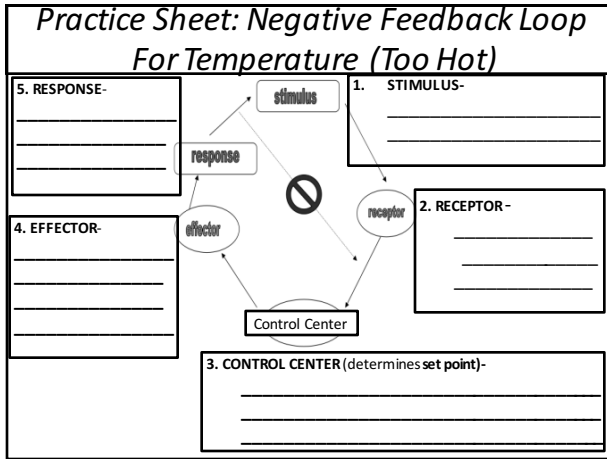
pH Blood Pressure Blood Sugar

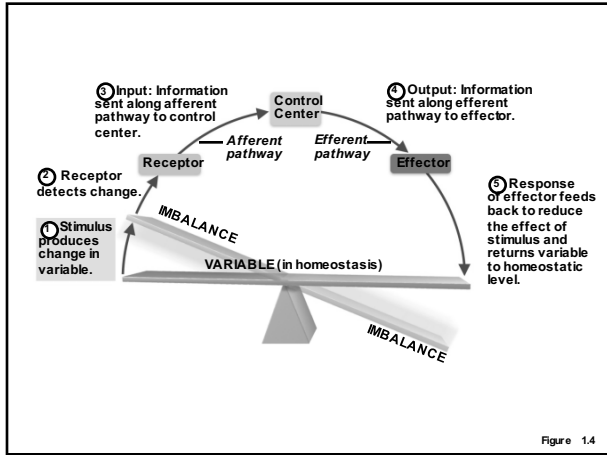
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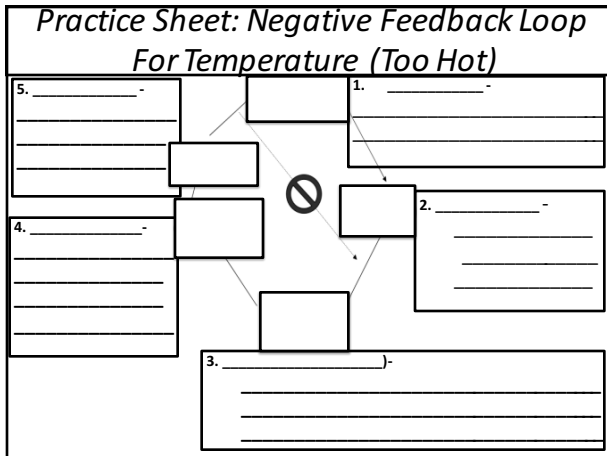
VI. Homeostasis

C. Maintaining Homeostasis

1. Body communicates through neuronal & hormonal control systems
 - a. Receptor
 - i. Responds to changes in the environment (stimuli)
 - ii. Sends information to the control center
 - b. Control Center
 - i. Determines set point -
 - a. ex: body temp. 37°C or 98.6°F
 - b. Body usually operates within a normal range (slight increases and decreases around the set point)
 - ii. Analyzes information
 - iii. Determines appropriate response or course of action
 - c. Effector (muscles or glands)
 - i. Executes response







VI. Homeostasis – maintaining a stable internal environment within narrow limits, regardless of environmental changes

C. Feedback Mechanisms *When in doubt* **Pushes back towards set point**

1. Negative Feedback

- Includes most homeostatic control mechanisms
 - ex: heart rate; blood pressure; body temp.; rate of respiration; blood glucose, oxygen, and carbon dioxide levels, etc. **Temperature control**
- Shuts off the original stimulus or reduces its intensity
 - i.e. moves the variable back toward the set point

c. Works like a household thermostat

VI. Homeostasis – maintaining a stable internal environment within narrow limits, regardless of environmental changes

C. Feedback Mechanisms **Pushes further away from set point**

2. Positive Feedback

- Has an amplifying effect that increases the original stimulus to push the variable further away from the set point
- Only normal occurrences are in
 - Others are the result of pathology and are harmful **Blood Clotting, Contractions, Sexual response**
 - ex: heart attack due to restricted blood flow to the heart eventually results in less cardiac output which again decreases blood flow

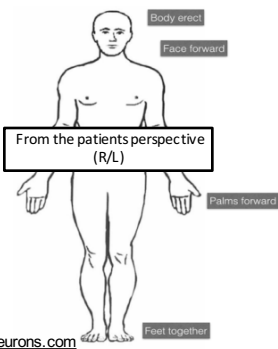
Notes: Pg 3 **VII. The Language of Anatomy**

A. Special terminology is used to prevent misunderstanding

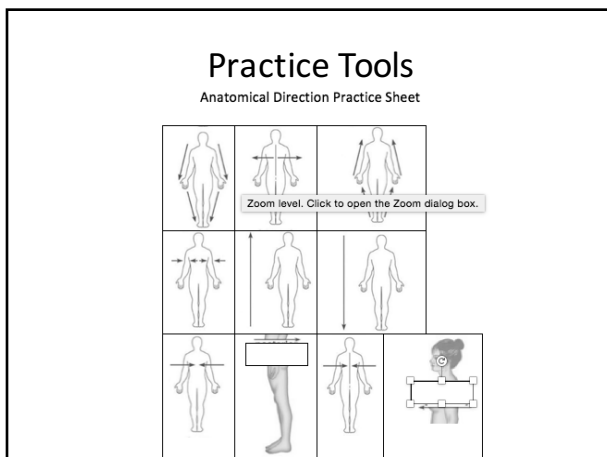
B. Exact terms are used for:

- Position
- Direction
- Regions
- Structures

We use this information to prevent amputation of the wrong limb!



afistfulofneurons.com



Notes: Pg 3

VII. The Language of Anatomy

C. Orientation and Directional Terms

- Proper Anatomical Position
 - A point of reference
- Directional Terms
 - Superior / Inferior
 - Anterior (ventral) / Posterior (dorsal)
 - Medial / Lateral
 - Proximal / Distal
 - Superficial / Deep
- Regional Terms
 - Axial
 - Head
 - Neck
 - Trunk
 - Thorax, Abdomen, Pelvis
 - Appendicular
 - Specific body areas

The Language of Anatomy 38

Anatomical Position 38

Directional Terms 38

Regional Terms 38

Anterior Body Landmarks • Posterior Body Landmarks

Body Planes and Sections 41

Body Cavities 41

Dorsal Body Cavity • Ventral Body Cavity • Other Body Cavities

Directional Terms

Superior: toward the head end or upper part of a structure or the body; above

The forehead is superior to the nose


The sternum is inferior to the clavicle

Inferior: away from the head end or toward the lower part of a structure or the body; below

Table 1.1

Directional Terms

Ventral (anterior): toward or at the front of the body; in front of



The heart is _____ to the spine

The back is _____ to the nose

Dorsal (posterior): toward or at the backside of the body; behind


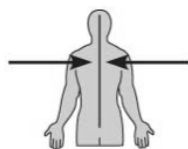
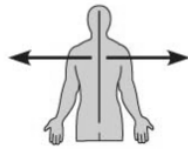


Table 1.1

Medial: toward or at the midline of the body; on the inner side of



Lateral: away from the midline of the body; on the outer side of

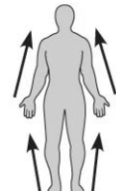


The right arm is _____ to the sternum

The nose is _____ to the ears

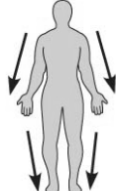
Table 1.1

Proximal: close to the origin of the body part or point of attachment to a limb to the body trunk



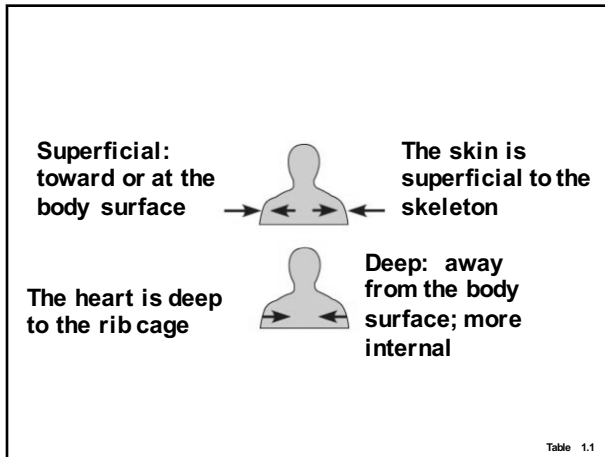
The elbow is proximal to the wrist

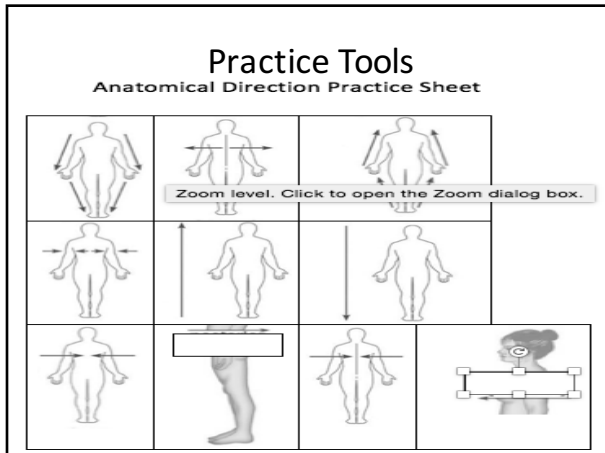
The knee is distal to the thigh

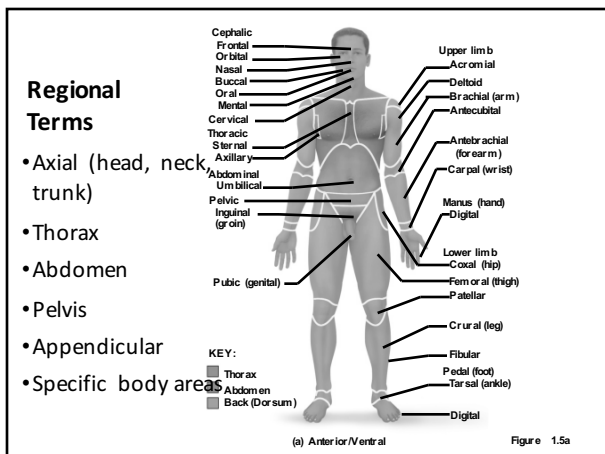


Distal: farther from the origin of a body part or the point of attachment of a limb to the body trunk

Table 1.1

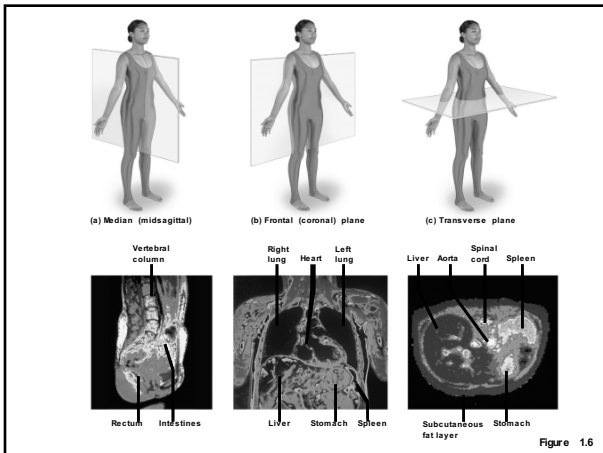






Body Planes and Sections

- A frontal, or coronal, section divides the body (or organ) into anterior and posterior parts.
- A transverse, or cross, section divides the body (or organ) into superior and inferior parts.
- A median, or midsagittal, section divides the body (or organ) into *equal* left and right parts.
- A sagittal section divides the body (or organ) into left and right parts.
- An oblique section is a diagonal cross section



Body Planes and Sections

- Oblique section through the trunk

